



## **Study of the effect of in ovo injecting hatching eggs with aqueous and alcoholic aloe vera extracts on the carcass parameters of broiler chickens**

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### **Abstract:**

This study was conducted in the poultry field, College of Agriculture, Al-Muthanna University, from January 29, 2024 to March 3, 2024, To know the effect of in ovo injecting of hatching eggs with local aloe vera extracts on hatching egg and chicks traits of Ross308 broiler. 600 eggs weighing  $55 \pm 1$  gm were used in the experiment, distributed into six treatments, 100 eggs per treatment, placed in incubator dishes, injected with Aloe vera extracts after 18 days of incubation, after hatching, 270 were selected, distributed with 45 chicks per treatment, with three replicates for each treatment (15 chicks/ replicate). The treatments were as follows: **T1:** Negative control treatment (without injection). **T2:** Positive control (Injection with sterile distilled water only). **T3:** Injection of hatching eggs with a concentration of 0.01 ml of the aqueous extract, **T4:** Injection of hatching eggs with a concentration of 0.02 ml of the aqueous extract, **T5:** Injection of hatching eggs with a concentration of 0.01 ml of the alcoholic extract, **T6:** Injection of hatching eggs with a concentration of 0.02 ml of alcoholic extract. The results of the experiment showed that T6 was superior in the average carcass weight, the dressing ratio with and without giblet, and the relative weight of the heart, liver, and gizzard. The same treatment also caused a significant increase in the weights of the main cuts (breast, thigh, and drumstick), while it significantly reduced the weight of the neck, wings, and back. We conclude from this experiment that in ovo injecting hatching eggs at an incubation period of 18 days with a concentration of 0.02 ml of the alcoholic extract of aloe vera leaves,

contributed to improving the production standards of the weights of the main and secondary cuts and the dressing percentage of broiler carcasses.

**Keywords:** In ovo injection, Hatching egg, aloe vera plant, natural extracts, carcass cuts.

### **Introduction:**

The development of the poultry production sector has led to the use of many technologies that can increase the level of production in terms of quantity and quality, including the technology of injecting hatching eggs as an early feeding method for broiler embryos [1, 2].

The poultry industry has currently witnessed several technologies specialized in the field of hatching in order to ensure the vitality of embryos, directly reflected in the production of healthy chicks, stimulating the increase in the speed of embryos and chicks later, by in ovo injecting hatching eggs with different extracts of aloe vera leaves, characterized by the diversity of their chemical content of active compounds. The incubation period and the development of embryo growth towards hatching, have now become of great importance in the success of poultry farming, producing the largest amount of white protein more than ever before [3, 4, 5].

The technique of in ovo injecting eggs with external nutrient solutions such as natural antioxidants or different nutrients throughout the incubation period, can be an explicit method to enhance the performance of chicks, as

studies have recently turned to injecting hatching eggs with extracts of medicinal plants. The multiple considerations performed by medicinal plant extracts have attracted researchers, interested parties and producers to use them, due to the multiple biological activities they possess and provide to embryos during the incubation period, in addition to being appetite and digestion stimulants, they contribute to improving the immune status of chicks, because of their effects in medical treatments as anti-inflammatory and antioxidants [6].

Those interested in using plant resources to provide safe and good food for human consumption free of prohibited antibiotics, as medicinal plants are characterized by their extracts containing many compounds, characterized by their medical, therapeutic and nutritional properties [7, 8, 9]. Including Aloe vera plants, which is one of the medicinal plants, has been used for a long time because it contains many medically effective compounds, which number exceeds 200 active compounds, the most important of which are phenols, flavonoids, carotenoids, sugars, saturated and unsaturated fatty acids, amino acids, anthraquinones,

vitamins, essential oils and antioxidant enzymes. Many studies have shown the importance of aqueous and alcoholic aloe vera extracts in improving the growth and productivity of broiler chickens and the efficiency of feed consumption and feed conversion. The leaves and flowers of the plant are the effective plant part used [10, 11, 12].

The current study aims to in ovo inject hatching eggs with aqueous and alcoholic extracts of Aloe Vera leaves as biological precursors, to reduce economic costs by enhancing the immune aspect, thus reducing the use of antibiotics in poultry feeding, to determine the best injection dose of locally extracted medicinal plants in carcass parameters and body weights of 308Ross broiler breeders.

### **Materials and Methods:**

This study was conducted in the poultry field, College of Agriculture, Al-Muthanna University, from January 29, 2024 to March 3, 2024, To know the effect of in ovo injecting of hatching eggs with local aloe vera extracts on the productive traits of Ross308 broiler. 600 eggs weighing  $55 \pm 1$  gm were used in the experiment, distributed into six treatments, 100 eggs per treatment, placed in incubator dishes, injected with Aloe vera extracts after 18 days of incubation, after hatching, 270 were selected, distributed with 45 chicks per treatment, with three replicates for each treatment (15 chicks/

replicate). The treatments were as follows:

**T1:** Negative control treatment (without injection).

**T2:** Positive control (Injection with sterile distilled water only).

**T3:** Injection of hatching eggs with a concentration of 0.01 ml of the aqueous extract.

**T4:** Injection of hatching eggs with a concentration of 0.02 ml of the aqueous extract.

**T5:** Injection of hatching eggs with a concentration of 0.01 ml of the alcoholic extract.

**T6:** Injection of hatching eggs with a concentration of 0.02 ml of alcoholic extract.

### **In ovo injection procedure:**

In ovo injection of alcoholic and aqueous extracts of aloe vera oil extract was carried out 18 days after the eggs were introduced to the incubator. The eggs were injected according to the following steps:

- Preparing the solutions prepared for injection according to the concentrations approved in the research plan and sterilizing the wide end of each egg with an alcoholic sterilizer with a concentration of 70% ethanol.

- Before the injection, the temperature of the injection solution

was about 30°C so as not to shock the embryo.

- Preparing a room with conditions close to those of the incubator in terms of temperature, as heating was operated from two air conditioners, where the room temperature was approximately 35°C, and the room was sprayed with water to raise the humidity in it.
- The eggs were examined by candling and the air chamber was identified at the wide end of the egg from the air space area where the nutrient solution was injected. After the light examination, unfertilized eggs or those with dead embryos were excluded. The injection area was sterilized with cotton soaked in

alcohol, as was the piercer. The egg shell was pierced with the piercer, taking into account not to cause a crack in the shell and avoiding the blood vessels of the embryo. The shell was pierced in a circular motion and the nutrient solution was injected using an automatic syringe. Needell (23 Gauge) was used after calibrating it to 0.1 and 0.2 ml. After completing the injection, the hole was closed with nail polish and the eggs were returned to the incubator until the hatching date.

The chicks were fed, according to the recommendations of the producing company, with starter feed for a period of 1-15 days and with final feed for a period of 16-35 days (Table1).

**Table 1. Proportions of the materials included in the feeds used in the experiment.**

| Items                              | Starter<br>(1-15 days) | Finisher<br>(16-35 days) |
|------------------------------------|------------------------|--------------------------|
| Maize                              | 60.20                  | 65.70                    |
| Soybean meal                       | 34.30                  | 29.30                    |
| Premix                             | 2.50                   | 2.50                     |
| Oil                                | 1.00                   | 1.00                     |
| Limestone                          | 1.00                   | 0.70                     |
| Dicalcium phosphate                | 0.60                   | 0.40                     |
| Antitoxin                          | 0.40                   | 0.40                     |
| Total                              | 100                    | 100                      |
| <b>Chemical analysis</b>           |                        |                          |
| Crude protein (%)                  | 20.51                  | 18.80                    |
| Metabolized energy (Kcal/ kg diet) | 2960                   | 3027                     |
| Calcium (%)                        | 0.93                   | 0.85                     |
| Phosphorus (%)                     | 0.48                   | 0.45                     |
| Methionine (%)                     | 0.55                   | 0.50                     |
| Lysine (%)                         | 1.35                   | 1.25                     |
| Methionine + Cystine (%)           | 0.91                   | 0.85                     |

#### **Studied Traits:**

The weight carcass parameters were studied after 35 days of weighing the birds, which included the carcass weight, the dressing percentage with and without the giblet, and the

relative weight of each of the heart, liver, and gizzard. The relative weight of the main carcass cuts (breast, thigh, and drumstick). The relative weight of

the secondary cuts (with wings, neck, and back).

### **Statistical Analysis:**

The data for the studied traits were analyzed using Completely Randomized Design (CRD) to determine the effect of different treatments and the significance of the differences between treatments was tested using Duncan [13] multinomial test at a significance level of 0.05 and using the statistical program SPSS (2012) in the statistical analysis.

### **Results and discussion:**

#### **Carcass weight and dressing ratio with and without giblet:**

Table (2) shows significant differences ( $P \leq 0.05$ ) in the dressing ratio with and without giblet. As a result of treating in ovo injection of hatching eggs with different concentrations of aqueous and alcoholic extract of Aloe Vera leaves. T6 was a significant effect by recording the highest average carcass weight (2409.33 gm), outperforming all other experimental treatments, while T2 recorded the lowest average (2094.33 gm).

As for the dressing ratio without giblet, treatments T4, T5 and T6 were a significant superiority compare with the rest of the experimental treatments without any significant difference among them, by achieving the highest average (77.86, 79.28 and 78.95)% respectively. In contrast, T2 achieved the lowest average (69.64%).

The relative weight of the heart had a significant effect according to the experimental treatments. T6 achieved a significant increase with the highest average (1.77%), thus outperforming all experimental treatments except for treatment T5 which recorded an average (1.69%) without any significant difference, while the lowest average was achieved at T2 with an average of 1.30 %.

A significant effect was found in the relative weight of the liver with the effect of treatment T6, which achieved a significant superiority over all experimental treatments with the highest average (2.68%), compared to treatment T2 which achieved the lowest average of 1.92%.

It was also noted from the data of the same table a significant response in the relative weight of the gizzard. All in ovo injection treatments with aqueous and alcoholic extracts achieved a significant effect, without there being any significant differences among them with an average of 0.59, 0.61, 0.60 and 0.60% respectively. In contrast to the negative and positive measurement treatments which recorded an average of 0.52 and 0.47% respectively without any significant difference.

Did not differ for the dressing ratio with the giblet, as significant differences were recorded due to the effect of the experimental treatments, as treatments T4, T5 and T6 achieved the highest average, respectively,

without significant differences among them, with the highest average of 82.64, 84.14 and 84.02%, respectively,

compared to T2, was the lowest averages (73.35%).

**Table (2) Effect of in ovo injecting hatching eggs with different levels of aqueous and alcoholic extracts of aloe vera leaves on the dressing ratio with and without giblet of broilers (mean  $\pm$  standard error).**

| Treatments | Carcass weight (gm)          | dressing ratio with giblet | Heart relative weight | Liver relative weight | Gizzard relative weight | dressing ratio without giblet |
|------------|------------------------------|----------------------------|-----------------------|-----------------------|-------------------------|-------------------------------|
| T1         | 2175.33 $\pm$ 3.17<br>e      | 73.36 $\pm$ 0.21<br>c      | 1.40 $\pm$ 0.03<br>d  | 2.12 $\pm$ 0.03<br>d  | 0.52 $\pm$ 0.01<br>b    | 77.42 $\pm$ 0.36<br>c         |
| T2         | 2094.33 $\pm$ 1.67<br>f      | 69.64 $\pm$ 0.02<br>d      | 1.30 $\pm$ 0.03<br>e  | 1.92 $\pm$ 0.05<br>e  | 0.47 $\pm$ 0.02<br>b    | 73.35 $\pm$ 1.12<br>d         |
| T3         | 2234.00 $\pm$ 3.60<br>d      | 75.73 $\pm$ 0.42<br>b      | 1.55 $\pm$ 0.03<br>c  | 2.29 $\pm$ 0.03<br>c  | 0.59 $\pm$ 0.01<br>a    | 80.18 $\pm$ 0.26<br>b         |
| T4         | 2263.33 $\pm$ 6.48<br>c      | 77.86 $\pm$ 0.53<br>a      | 1.66 $\pm$ 0.03<br>b  | 2.50 $\pm$ 0.03<br>b  | 0.61 $\pm$ 0.02<br>a    | 82.64 $\pm$ 0.53<br>a         |
| T5         | 2361.00 $\pm$ 1.15<br>b      | 79.28 $\pm$ 0.17<br>a      | 1.69 $\pm$ 0.02<br>ab | 2.55 $\pm$ 0.03<br>b  | 0.60 $\pm$ 0.01<br>a    | 84.14 $\pm$ 0.10<br>a         |
| T6         | 2409.33 $\pm$ 12.2<br>5<br>a | 78.95 $\pm$ 0.17<br>a      | 1.77 $\pm$ 0.01<br>a  | 2.68 $\pm$ 0.03<br>a  | 0.60 $\pm$ 0.01<br>a    | 84.02 $\pm$ 0.06<br>a         |
| Sig.       | *                            | *                          | *                     | *                     | *                       | *                             |

### Main and secondary cuts:

Table (3) indicates that the experimental treatments have a significant effect on the indicators of the main and secondary cuts studied. Treatments T5 and T6 achieved a significant increase ( $P \leq 0.05$ ) on the relative weight of the breast with the highest average (38.88 and 38.90)% respectively without any significant difference among them, while T2 recorded the lowest average of 37.62%. As for the relative weight of the thigh, treatment T6 achieved a significant superiority ( $P \leq 0.05$ )

compared to all treatments with the highest average of 16.04%. As for the lowest average, it was recorded by treatments T1 and T2 with an average of (15.23 and 15.13)% respectively. The same thing happened with treatment T6 significantly outperforming all treatments in the relative weight of the drumstick with an average of 13.47% compared to treatment T2, which recorded the lowest average (12.66%).

The experimental treatments also had a significant effect ( $P \leq 0.05$ ) on the

secondary cuts indicators. The relative weight of the neck was significantly affected at T2, which recorded the highest average (5.45%), compared to T6, which achieved the lowest average (4.24%). As for the relative weight of the wings, the control treatments T1 and T2 recorded the highest average, without any significant difference among them (12.08 and 12.23)%,

respectively, compared to T6 (11.28%). As for the relative weight of the back, treatments T1, T2, T3 and T4 achieved the highest averages, respectively, without any significant differences among them, and reached 16.77, 16.82, 16.58 and 16.53%, respectively, while the lowest average was recorded at treatment T6 (15.57%).

**Table (3) Effect of in ovo injecting hatching eggs with different levels of aqueous and alcoholic extracts of aloe vera leaves on the relative weight of the main cuts (breast, thigh, and drumstick) and the secondary cuts (neck, wings, and back) (mean  $\pm$  standard error).**

| Treatments  | Main cut (%)          |                       |                       | Secondary cuts (%)   |                        |                       |
|-------------|-----------------------|-----------------------|-----------------------|----------------------|------------------------|-----------------------|
|             | Breast                | Thigh                 | Drumstick             | Neck                 | Wings                  | Back                  |
| <b>T1</b>   | 37.87 $\pm$ 0.02<br>c | 15.23 $\pm$ 0.02<br>d | 12.85 $\pm$ 0.01<br>d | 5.14 $\pm$ 0.03<br>b | 12.08 $\pm$ 0.10<br>a  | 16.77 $\pm$ 0.08<br>a |
| <b>T2</b>   | 37.62 $\pm$ 0.04<br>d | 15.13 $\pm$ 0.01<br>d | 12.66 $\pm$ 0.01<br>e | 5.45 $\pm$ 0.10<br>a | 12.23 $\pm$ 0.10<br>a  | 16.82 $\pm$ 0.11<br>a |
| <b>T3</b>   | 38.24 $\pm$ 0.03<br>b | 15.51 $\pm$ 0.01<br>c | 12.84 $\pm$ 0.01<br>d | 4.98 $\pm$ 0.04<br>b | 11.75 $\pm$ 0.06<br>b  | 16.58 $\pm$ 0.07<br>a |
| <b>T4</b>   | 38.43 $\pm$ 0.01<br>b | 15.61 $\pm$ 0.01<br>c | 13.01 $\pm$ 0.02<br>c | 4.71 $\pm$ 0.04<br>c | 11.61 $\pm$ 0.07<br>bc | 16.53 $\pm$ 0.10<br>a |
| <b>T5</b>   | 38.88 $\pm$ 0.04<br>a | 15.86 $\pm$ 0.06<br>b | 13.18 $\pm$ 0.03<br>b | 4.43 $\pm$ 0.01<br>d | 11.47 $\pm$ 0.04<br>cd | 16.06 $\pm$ 0.11<br>b |
| <b>T6</b>   | 38.90 $\pm$ 0.13<br>a | 16.04 $\pm$ 0.07<br>a | 13.47 $\pm$ 0.02<br>a | 4.24 $\pm$ 0.04<br>e | 11.28 $\pm$ 0.04<br>d  | 15.57 $\pm$ 0.12<br>c |
| <b>Sig.</b> | *                     | *                     | *                     | *                    | *                      | *                     |

The increase in the weights of the breast, thigh and drumstick is a good indicator of the quality of the carcasses produced from broiler chickens, because they are the most meat found in the main cuts of the broiler carcass [14]. Therefore, the significant improvement in the carcass parameters represented by both the dressing ratio and the relative weight of the main cuts (Tables 2 and 3) for the treatments of the aloe vera leaf

extract compared to the control treatment, may be attributed to the significant improvement in the final body weight averages. Since there is a direct relationship between the body weight average and the carcass characteristics studied, since the dressing percentage and carcass cuts are a reflection of the live body weight rates, as the dressing ratio increases [15]. Or the moral improvement in the carcass characteristics may be

attributed to the aloe vera leaves having many effective compounds, that have a significant effect in increasing the absorption of nutrients, and their representation to benefit from them for growth and building tissues and muscles, especially the compounds aloin and emodin, which have a significant effect as an antioxidant, antiviral and antimicrobial agent, and thus improve the bird's immunity, then positively affect the increase in body weight and carcass weight. This is reflected in the fullness of the bird's body, especially the meaty muscles, which affects as a final result in increasing the percentage of the main cuts preferred by the consumer, as a result of their fullness with muscles compared to the rest of the cuts [16].

The significant increase in the purity ratio and body weight of the body parts, due to the concentration of the aloe vera leaf extracts, because they contain saponins, which play an effective role in increasing the permeability of the intestinal cell walls, and then increasing the absorption of the largest amount of nutrients and benefiting from them [17]. In addition to containing many vitamins necessary for the oxidation process, including vitamins A, C, and E [18]. Also, aloe vera leaves contain a large group of fatty and amino acids necessary for growth, which improve body weight and weight gain, this increase is directly reflected in an increase in the weight of the carcass,

therefore, all of the above has a positive effect on the purity ratio [19]. Or the moral response may also be attributed to the fact that adding medicinal plants in general has a positive effect in improving the characteristics of the carcass, by increasing the absorption of amino acids, and benefiting more from the nutritional elements, which leads to an increase in the weight of the main cuts and the weight of the carcass [20].

The process of in ovo injecting hatching eggs with aloe vera leaf extracts provided several vitamins, that could be directly reflected in improving growth and development levels before and after hatching, as the plant leaves contain vitamin E [21], may play an important role in increasing the egg content of this vitamin, therefore it can be exploited to increase growth and development criteria, including indicators of body organs represented by their main and secondary cuts and the purification rate, as well as its ability to oxidize fatty acids that begin on the fourteenth day after hatching [22].

### **Conclusions:**

We conclude from our current study that injecting hatching eggs at 18 days of incubation, significantly improved the weight parameters of broiler chickens, this improvement increased



with increasing its concentration added by in ovo injection to the egg, this caused a significant improvement in the studied indicators, this confirms

the role of medicinal plants, including aloe vera, in improving the productive performance of broiler chickens.

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